

EXHIBIT 10



Cisco IOS IPv6 Command Reference

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

© 2013 Cisco Systems, Inc. All rights reserved.

default-information originate (OSPFv3)

To generate a default external route into an Open Shortest Path First version 3 (OSPFv3) for a routing domain, use the **default-information originate** command in IPv6 or IPv4 address family configuration mode. To disable this feature, use the **no** form of this command.

default-information originate [**always**| **metric** *metric-value*| **metric-type** *type-value*| **route-map** *map-name*]

no default-information originate [**always**| **metric** *metric-value*| **metric-type** *type-value*| **route-map** *map-name*]

Syntax Description

always	(Optional) Always advertises the default route regardless of whether the software has a default route.
metric <i>metric-value</i>	(Optional) Metric used for generating the default route. If you omit a value and do not specify a value using the default-metric router configuration command, the default metric value is 10. The default metric value range is from 0 to 16777214.
metric-type <i>type-value</i>	(Optional) External link type associated with the default route advertised into the OSPF for IPv6 routing domain. It can be one of the following values: 1 --Type 1 external route 2 --Type 2 external route The default is type 2 external route.
route-map <i>map-name</i>	(Optional) Routing process will generate the default route if the route map is satisfied.

Command Default

This command is disabled by default.

Command Modes

IPv6 address family configuration (config-router-af) IPv4 address family configuration (config-router-af)

Command History

Release	Modification
15.1(3)S	This command was introduced.
Cisco IOS XE Release 3.4S	This command was integrated into Cisco IOS XE Release 3.4S.
15.2(1)T	This command was integrated into Cisco IOS Release 15.2(1)T.
15.1(1)SY	This command was integrated into Cisco IOS Release 15.1(1)SY.

Usage Guidelines

Whenever you use the **redistribute** or the **default-information** command to redistribute routes into an OSPFv3 routing domain, the Cisco IOS software automatically becomes an Autonomous System Boundary Router (ASBR). However, an ASBR does not, by default, generate a *default route* into the OSPF for IPv6 routing domain. The software still must have a default route for itself before it generates one, except when you have specified the **always** keyword.

When you use this command for the OSPFv3 process, the default network must reside in the routing table, and you must satisfy the **route-map** *map-name* keyword and argument. Use the **default-information originate always route-map** *map-name* form of the command when you do not want the dependency on the default network in the routing table.

Examples

The following example specifies a metric of 100 for the default route redistributed into the OSPFv3 routing domain, an external metric type of type 2, and the default route to be always advertised:

```
Router(config-router-af)# default-information originate always metric 100 metric-type 2
```

ipv6 nd prefix

To configure which IPv6 prefixes are included in IPv6 Neighbor Discovery (ND) router advertisements, use the **ipv6 nd prefix** command in interface configuration mode. To remove the prefixes, use the **no** form of this command.

```
{ipv6 nd prefix {ipv6-prefix/prefix-length| default} [no-advertise] [valid-lifetime preferred-lifetime [off-link|
no-rtr-address] no-autoconfig| no-onlink]]] [at valid-date| preferred-date [off-link| no-rtr-address]
no-autoconfig]]}
```

```
no ipv6 nd prefix {ipv6-prefix/prefix-length| default}
```

Syntax Description

<i>ipv6-prefix</i>	The IPv6 network number to include in router advertisements. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.
<i>/ prefix-length</i>	The length of the IPv6 prefix. A decimal value that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address). A slash mark must precede the decimal value.
default	Default values are used.
no-advertise	(Optional) The prefix is not advertised.
<i>valid-lifetime</i>	(Optional) The amount of time (in seconds) that the specified IPv6 prefix is advertised as being valid.
<i>preferred-lifetime</i>	(Optional) The amount of time (in seconds) that the specified IPv6 prefix is advertised as being preferred.
off-link	(Optional) Configures the specified prefix as off-link. The prefix will be advertised with the L-bit clear. The prefix will not be inserted into the routing table as a Connected prefix. If the prefix is already present in the routing table as a Connected prefix (for example, because the prefix was also configured using the ipv6 address command), then it will be removed.
no-rtr-address	(Optional) Indicates that the router will not send the full router address in prefix advertisements and will not set the R bit.

no-autoconfig	(Optional) Indicates to hosts on the local link that the specified prefix cannot be used for IPv6 autoconfiguration. The prefix will be advertised with the A-bit clear.
no-onlink	(Optional) Configures the specified prefix as not on-link. The prefix will be advertised with the L-bit clear.
at <i>valid-date preferred-date</i>	(Optional) The date and time at which the lifetime and preference expire. The prefix is valid until this specified date and time are reached. Dates are expressed in the form <i>date-valid-expire month-valid-expire year-valid-expire</i> and <i>hh:mm-valid-expire date-prefer-expire month-prefer-expire year-valid-expire hh:mm-prefer-expire</i> .

Command Default

All prefixes configured on interfaces that originate IPv6 router advertisements are advertised with a valid lifetime of 2,592,000 seconds (30 days) and a preferred lifetime of 604,800 seconds (7 days).

Note that by default:

- All prefixes will be inserted in the routing table as Connected prefixes
- All prefixes will be advertised as on-link (for example, the L-bit will be set in the advertisement)
- All prefixes will be advertised as an autoconfiguration prefix (for example, the A-bit will be set in the advertisement)

Command Modes

Interface configuration

Command History

Release	Modification
12.2(13)T	This command was introduced. This command replaces the ipv6 nd prefix-advertisement command.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.3(11)T	The no-rtr-address keyword was added.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.2(32.08.01)REC154	The no-onlink keyword was added. <<Correct release? Looks odd>>

Release	Modification
15.2(2)SA2	This command was implemented on the Cisco ME 2600X Series Ethernet Access Switches.

Usage Guidelines

This command allows control over the individual parameters per prefix, including whether the prefix should be advertised.

By default, prefixes configured as addresses on an interface using the **ipv6 address** command are advertised in router advertisements. If you configure prefixes for advertisement using the **ipv6 nd prefix** command, then only these prefixes are advertised.

Default Parameters

The **default** keyword can be used to set default parameters for all prefixes.

Prefix Lifetime and Expiration

A date can be set to specify the expiration of a prefix. The valid and preferred lifetimes are counted down in real time. When the expiration date is reached, the prefix will no longer be advertised.

On-Link

When on-link is "on" (by default), the specified prefix is assigned to the link. Nodes sending traffic to such addresses that contain the specified prefix consider the destination to be locally reachable on the link.

Autoconfiguration

When autoconfiguration is "on" (by default), it indicates to hosts on the local link that the specified prefix can be used for IPv6 autoconfiguration.

The configuration options affect the L-bit and A-bit settings associated with the prefix in the IPv6 ND Router Advertisement, and presence of the prefix in the routing table, as follows:

- Default L=1 A=1 In Routing Table
- no-onlink L=0 A=1 In Routing Table
- no-autoconfig L=1 A=0 In Routing Table
- no-onlink no-autoconfig L=0 A=0 In Routing Table
- off-link L=0 A=1 Not in Routing Table
- off-link no-autoconfig L=0 A=0 Not in Routing Table

Examples

The following example includes the IPv6 prefix 2001:0DB8::/35 in router advertisements sent out Ethernet interface 0/0 with a valid lifetime of 1000 seconds and a preferred lifetime of 900 seconds:

```
Router(config)# interface ethernet 0/0
Router(config-if)# ipv6 nd prefix 2001:0DB8::/35 1000 900
```

The following example advertises the prefix with the L-bit clear, so that the prefix is retained in the IPv6 routing table:

```
Router(config)# interface ethernet 0/0
Router(config-if)# ipv6 address 2001::1/64
Router(config-if)# ipv6 nd prefix 2001::/64 3600 3600 no-onlink
```


Related Commands

Command	Description
ipv6 address link-local	Configures an IPv6 link-local address for an interface and enables IPv6 processing on the interface.
ipv6 address eui-64	Configures an IPv6 address and enables IPv6 processing on an interface using an EUI-64 interface ID in the low-order 64 bits of the address.
ipv6 mobile home-agent (interface configuration)	Initializes and starts the IPv6 Mobile home agent on a specific interface.
ipv6 nd managed-config-flag	Sets the "managed address configuration" flag in IPv6 router advertisements.
show ipv6 interface	Displays the usability status of interfaces configured for IPv6.

ipv6 neighbor

To configure a static entry in the IPv6 neighbor discovery cache, use the **ipv6 neighbor** command in global configuration mode. To remove a static IPv6 entry from the IPv6 neighbor discovery cache, use the **no** form of this command.

ipv6 neighbor *ipv6-address interface-type interface-number hardware-address*

no ipv6 neighbor *ipv6-address interface-type interface-number*

Syntax Description

<i>ipv6-address</i>	The IPv6 address that corresponds to the local data-link address. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.
<i>interface-type</i>	The specified interface type. For supported interface types, use the question mark (?) online help function.
<i>interface-number</i>	The specified interface number.
<i>hardware-address</i>	The local data-link address (a 48-bit address).

Command Default

Static entries are not configured in the IPv6 neighbor discovery cache.

Command Modes

Global configuration

Command History

Release	Modification
12.2(8)T	This command was introduced.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Release	Modification
15.2(2)SA2	This command was implemented on the Cisco ME 2600X Series Ethernet Access Switches.

Usage Guidelines

The **ipv6 neighbor** command is similar to the **arp** (global) command.

If an entry for the specified IPv6 address already exists in the neighbor discovery cache--learned through the IPv6 neighbor discovery process--the entry is automatically converted to a static entry.

Use the **show ipv6 neighbors** command to view static entries in the IPv6 neighbor discovery cache. A static entry in the IPv6 neighbor discovery cache can have one of the following states:

- INCOMPLETE (Incomplete)--The interface for this entry is down.
- REACH (Reachable)--The interface for this entry is up.



Note

Reachability detection is not applied to static entries in the IPv6 neighbor discovery cache; therefore, the descriptions for the INCOMPLETE and REACH states are different for dynamic and static cache entries. See the **show ipv6 neighbors** command for descriptions of the INCOMPLETE and REACH states for dynamic cache entries.

The **clear ipv6 neighbors** command deletes all entries in the IPv6 neighbor discovery cache, except static entries. The **no ipv6 neighbor** command deletes a specified static entry from the neighbor discovery cache; the command does not remove dynamic entries--learned from the IPv6 neighbor discovery process--from the cache. Disabling IPv6 on an interface by using the **no ipv6 enable** command or the **no ipv6 unnumbered** command deletes all IPv6 neighbor discovery cache entries configured for that interface, except static entries (the state of the entry changes to INCOMPLETE).

Static entries in the IPv6 neighbor discovery cache are not modified by the neighbor discovery process.



Note

Static entries for IPv6 neighbors can be configured only on IPv6-enabled LAN and ATM LAN Emulation interfaces.

Examples

The following example configures a static entry in the IPv6 neighbor discovery cache for a neighbor with the IPv6 address 2001:0DB8::45A and link-layer address 0002.7D1A.9472 on Ethernet interface 1:

```
Router(config)# ipv6 neighbor 2001:0DB8::45A ethernet1 0002.7D1A.9472
```

Related Commands

Command	Description
arp (global)	Adds a permanent entry in the ARP cache.
clear ipv6 neighbors	Deletes all entries in the IPv6 neighbor discovery cache, except static entries.

Command	Description
no ipv6 enable	Disables IPv6 processing on an interface that has not been configured with an explicit IPv6 address.
no ipv6 unnumbered	Disables IPv6 on an unnumbered interface.
show ipv6 neighbors	Displays IPv6 neighbor discovery cache information.